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MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 29 May 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-124**
Liu, C.T., "Investigating Cumulative Damage in a Highly Filled Polymeric Material (VuGraphs)"

2001 ASME Summer Meeting **(Statement A)**
(San Diego, CA, 27-29 June 01) (Deadline: 21 June 01)

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PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

Investigating Cumulative Damage in a Highly Filled Polymeric Material

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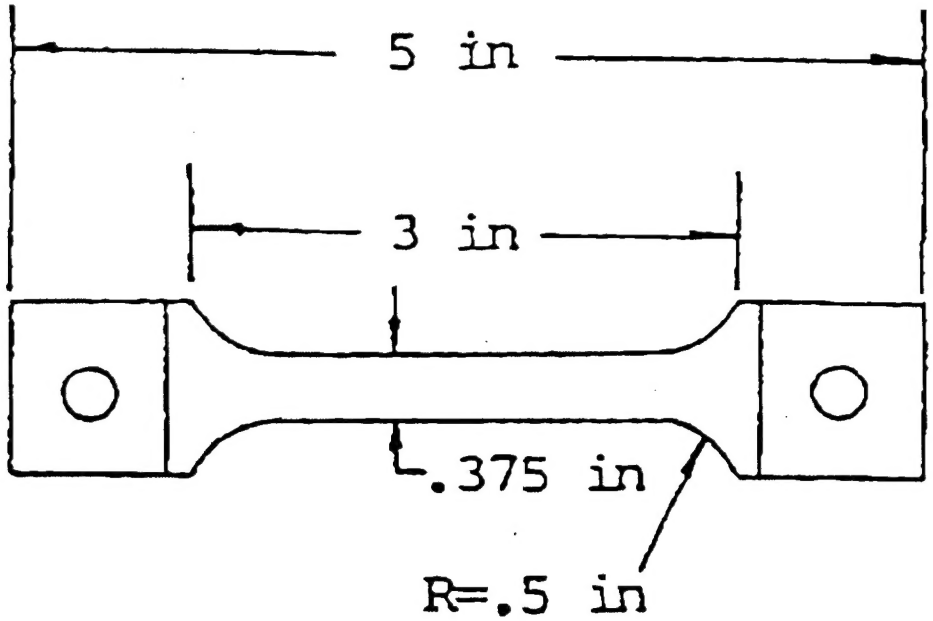
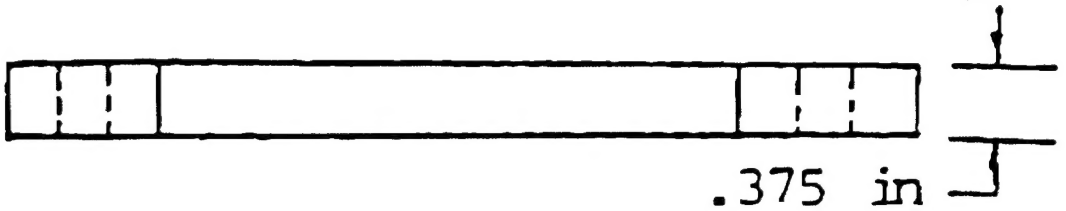
Objectives

- Investigate the Effects of Strain Rate and Cyclic Loading on Cumulative Damage in a Highly Filled Polymeric Material.

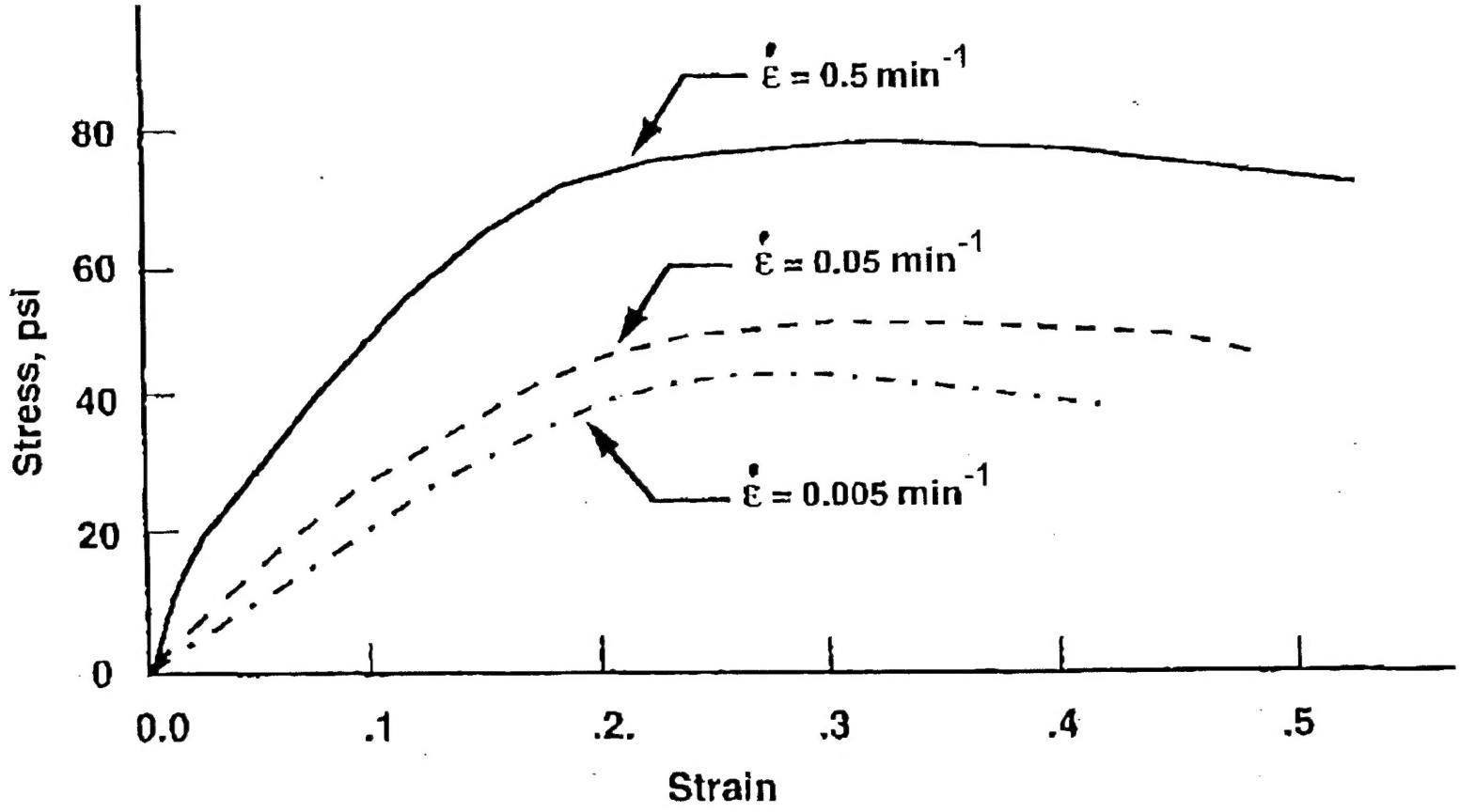
- Determine the Relationship between the NDE Damage Parameter and material Properties.

Specimen Geometry



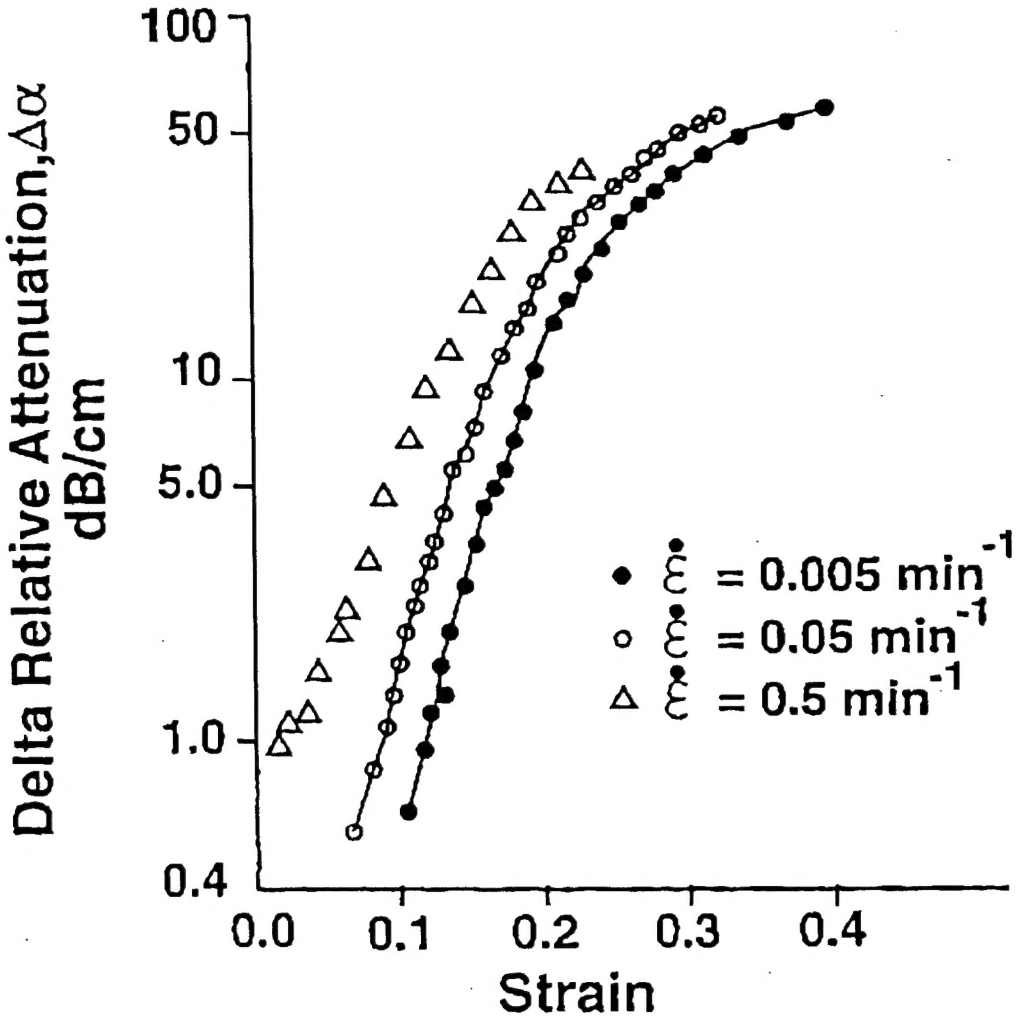


Stress-Strain Curves as Functions of Strain Rate

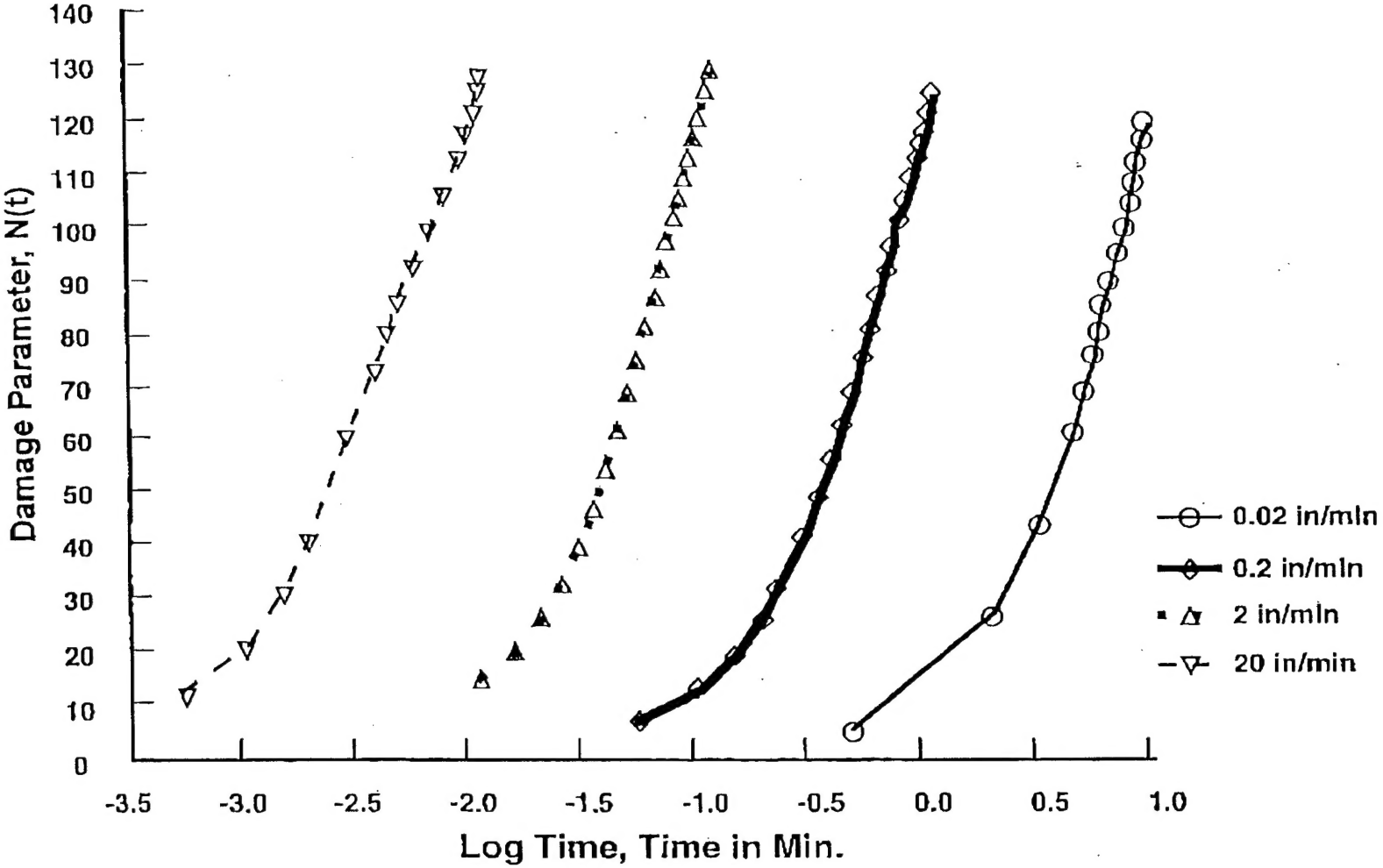


Relative Change in Acoustic Attenuation Versus Strain

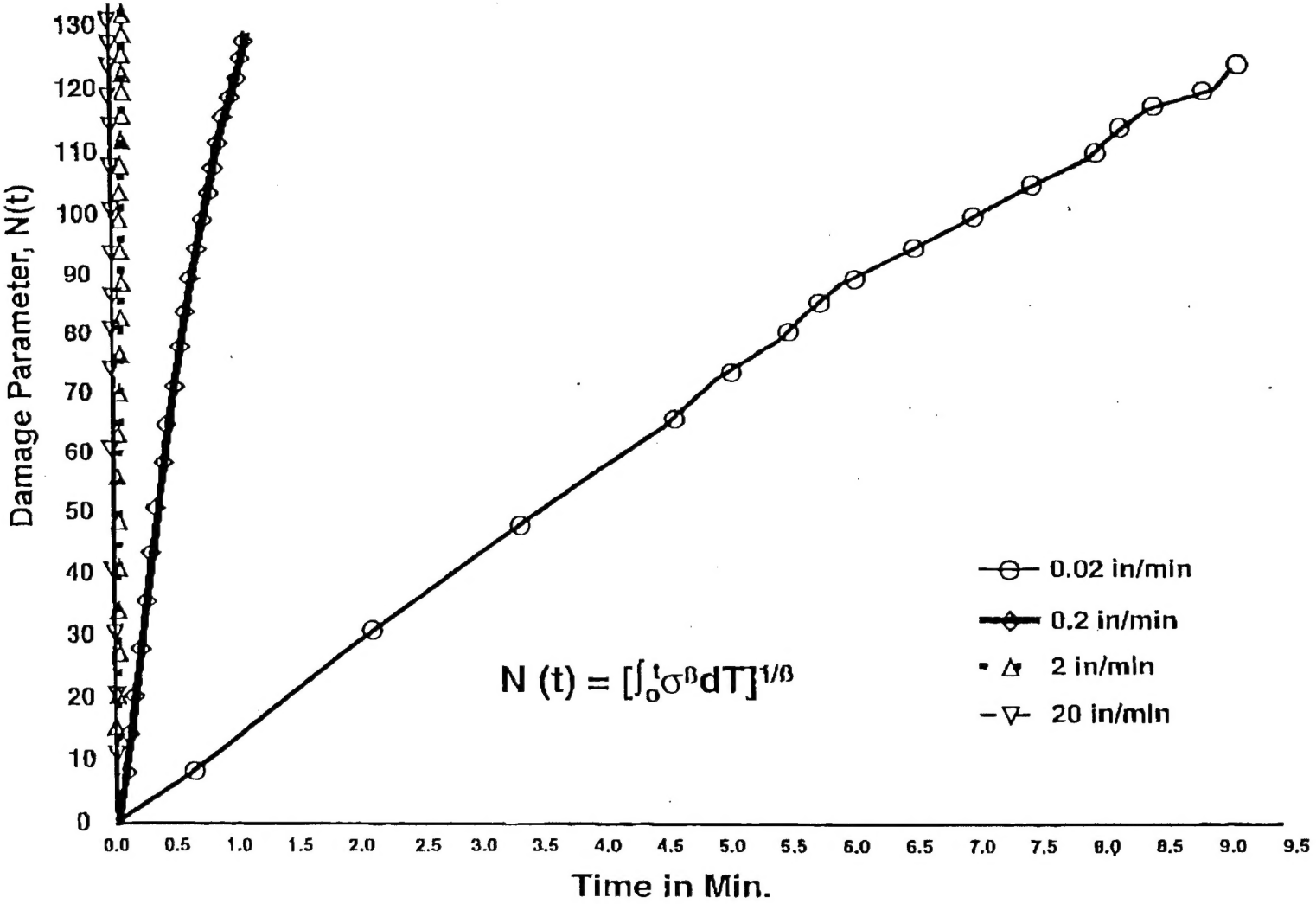
(constant strain rate loading)



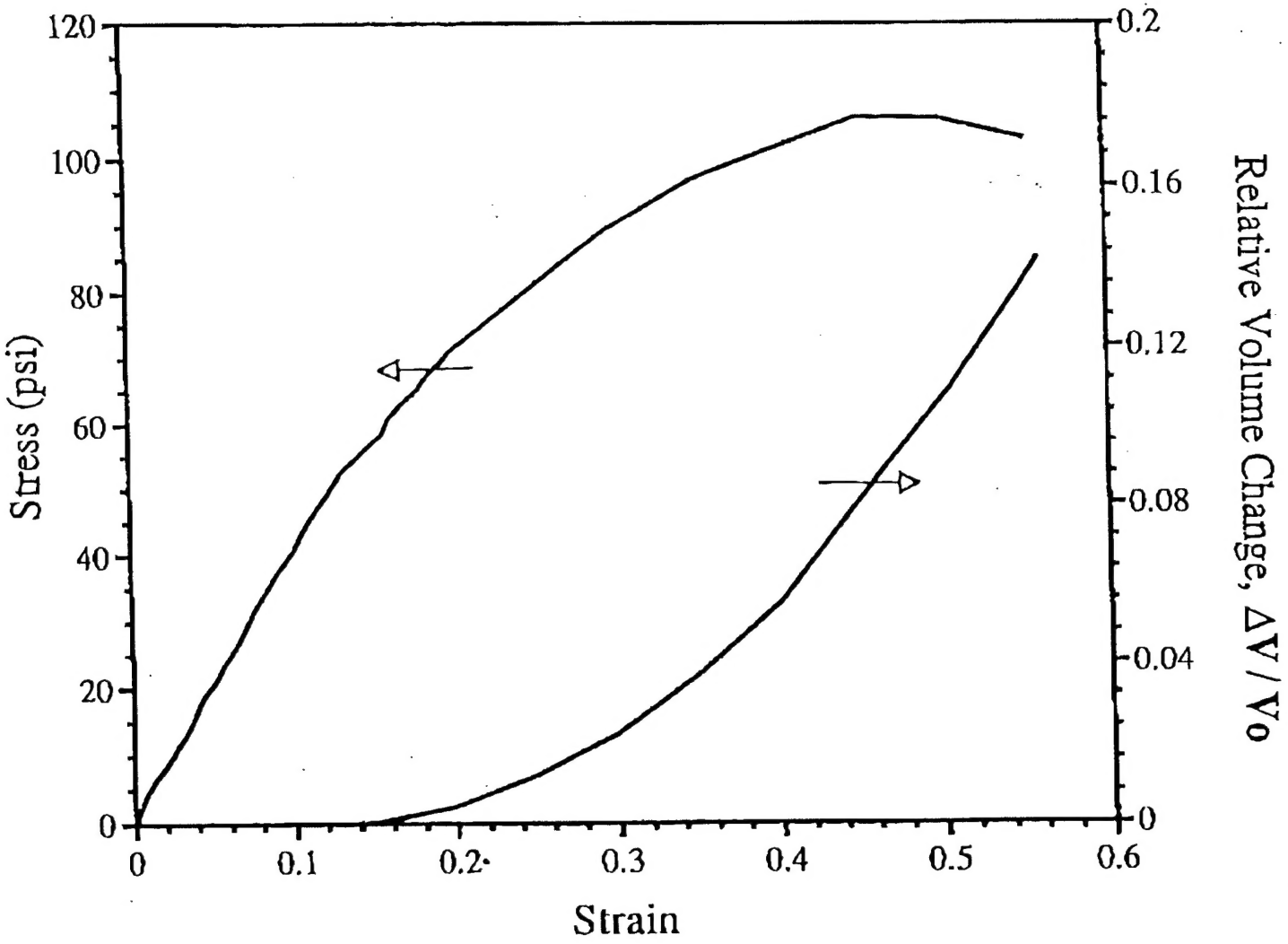
Damage Parameters Versus Log Time at Different Strain Rates



Damage Parameters Versus Time at Different Strain Rates

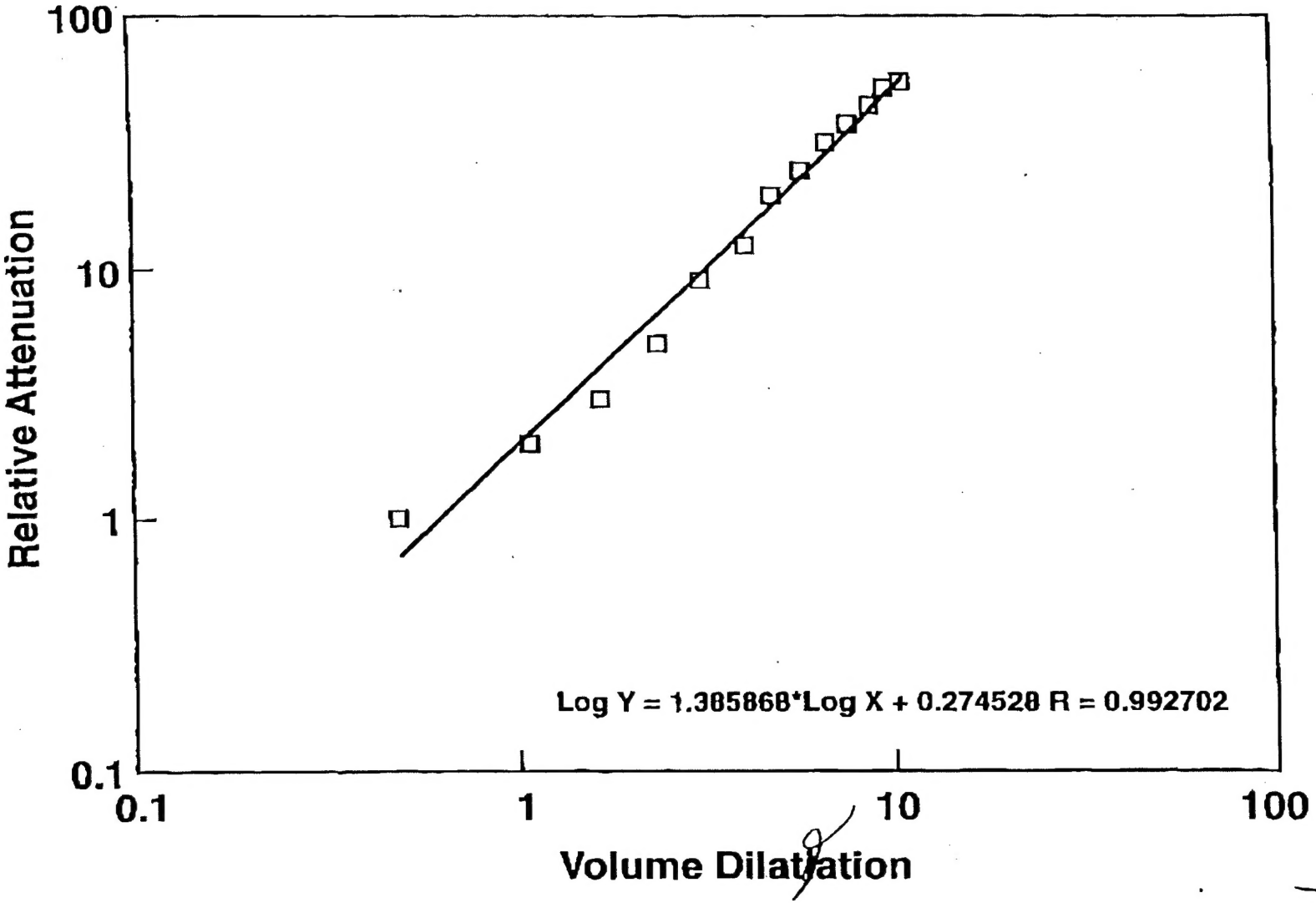


Material Behavior is Initially Linear and Incompressible; Following Dewetting, Response is Nonlinear and Compressible

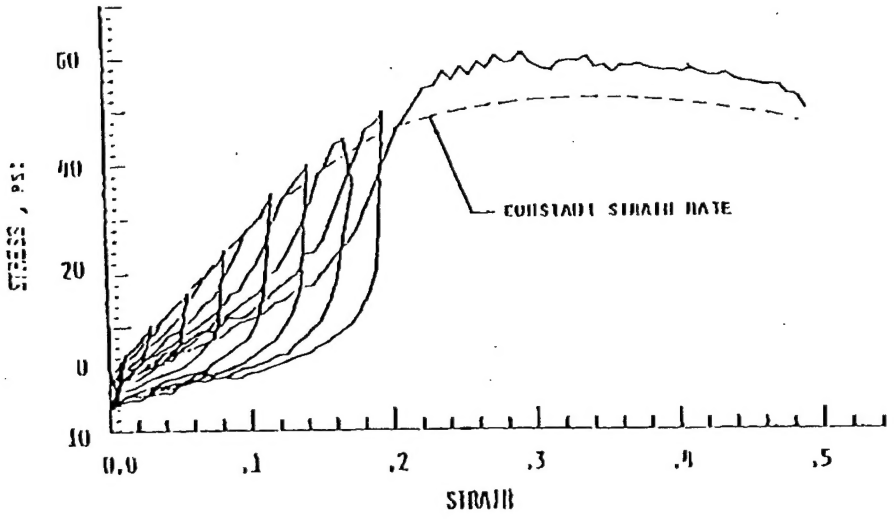


Relative Attenuation of Acoustic Energy Versus Volume Dilatation

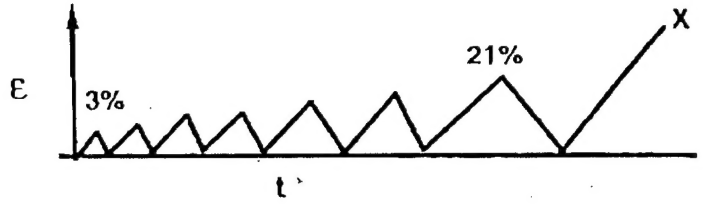
(monotonic loading)

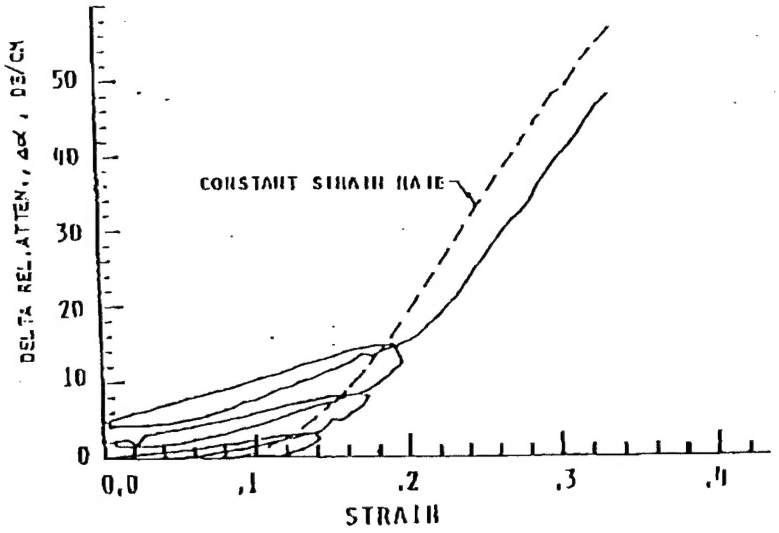


Cycle Stress-Strain Behavior and Relative Change in Acoustic Attenuation Under Cycle Loading Condition



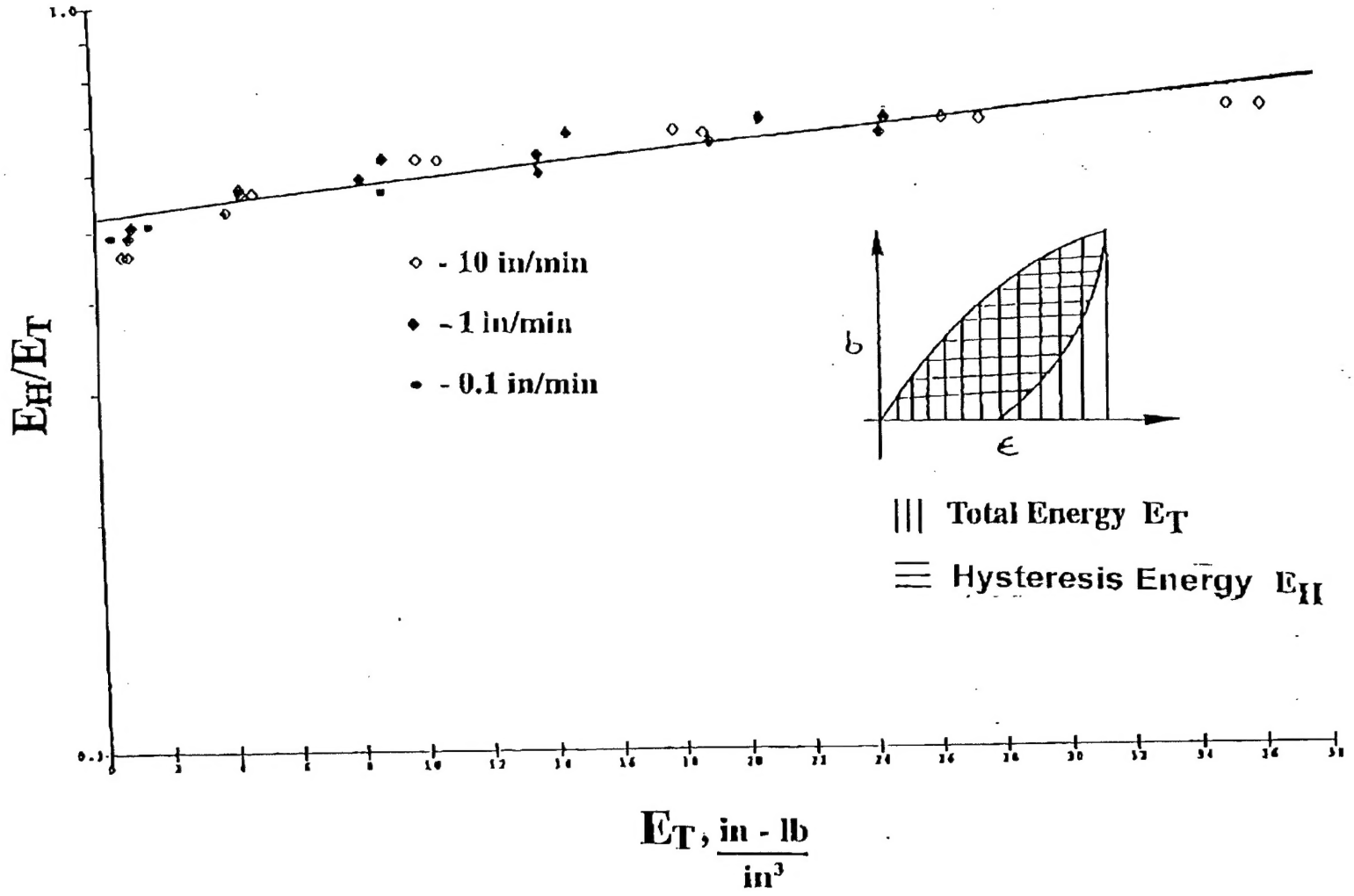
CYCLIC STRESS-STRAIN CURVES





RELATIVE CHANGE IN ACOUSTIC ATTENUATION VERSUS STRAIN

Ratio of Hysteresis Energy to Total Energy Versus Total Energy at Different Strain Rates



Conclusions

- Strain rate has a large effect on damage intensity.
- Strain rate has no significant effect on the critical damage intensity.
- A good correlation exists between the NDE damage parameter and the material property.
- The cyclic stress-strain curves exhibit the typical stress softening phenomena.